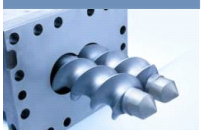
coperion
confidence through partnership

› compounding & extrusion
› materials handling
› service

ZSK 101

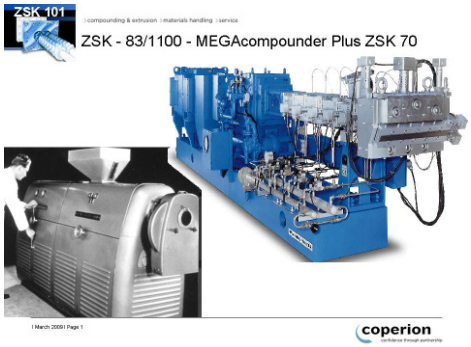


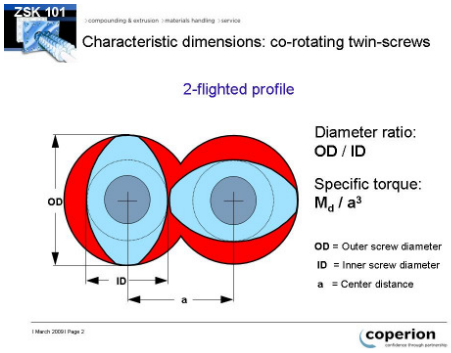
ZSK 101 COURSE OUTLINE

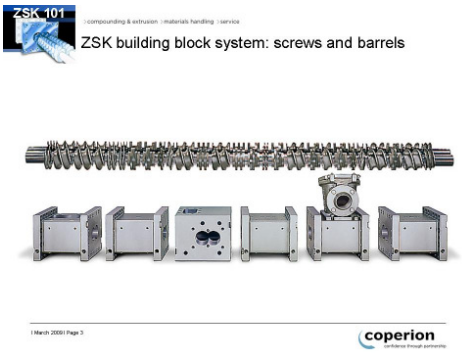
ZSK TWIN SCREW EXTRUSION COMPOUNDING SYSTEM

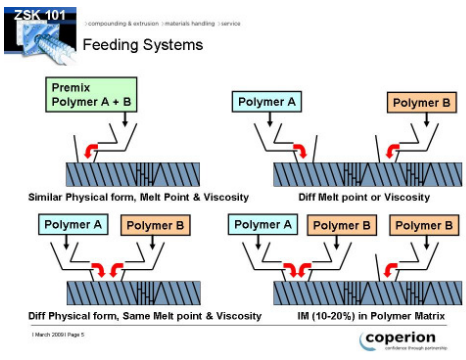
DAY 1:

- **I. INTRODUCTION**
- **II. ZSK DESIGN CHARACTERISTICS**
  - **A. Historical Background**
    1. Applications of Twin Screw
    2. Different ZSK Generations
  - **B. Definitions**
    1. Outer & Inner Diameter
    2. Torque
    3. Shear Rates
    4. Free Volume
  - **C. Basic Machine Components**
    1. Screw Bushings
    2. Kneading Blocks
    3. Special Elements
       a. SK/SF
       b. Distributive Mixing Elements
       c. 3-lobe KB
    4. Barrels
    5. Vents
  - **D. Pelletizer Options**
- **III. FEEDERS AND FEED HANDLING SYSTEMS**
- **IV. UNIT OPERATIONS Part 1**
  - **A. Feed Handling/Preparation**
  - **B. Feeding**
    1. Upstream Feeding
    2. Downstream Feeding
       a. Solids
       b. Liquids
  - **C. Plastification**
    1. Conductive/Convective
    2. Shear Dissipation





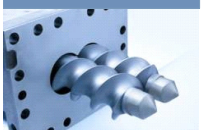




coperion
confidence through partnership

› compounding & extrusion
› materials handling
› service

ZSK 101



ZSK 101 COURSE OUTLINE

DAY 2:

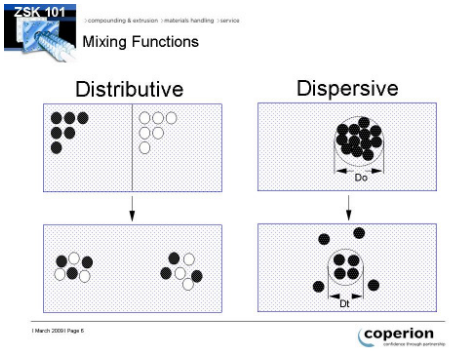
V. UNIT OPERATIONS Part 2
- **D. Mixing**
- **E. Devolatilization/Degassing**
- **F. Metering/Pressure Generation**
- **G. Discharge**
  - **1. Pelletizing Train**
  - **2. Direct Extrusion**

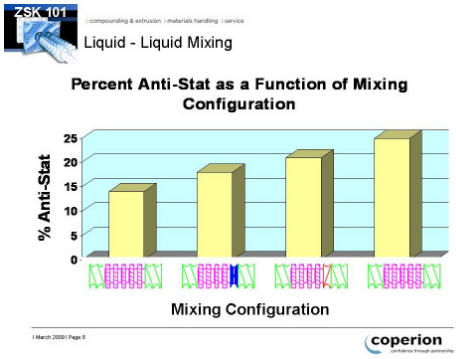
VI. PROCESS CONTROLS & INTERLOCKS
- **A. System Scope**
- **B. Design**
- **C. Safety Interlock System**

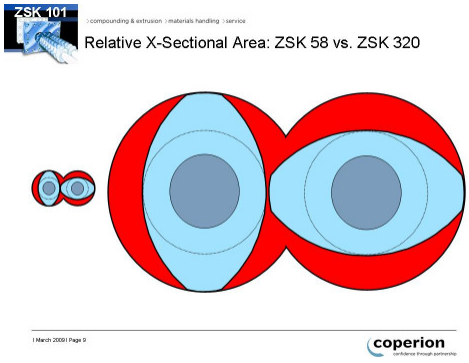
VII. EXAMPLES OF PROCESS SYSTEMS
- **A. Compounding**
  - **1. Dispersive**
  - **2. Distributive**
- **B. Devolatilization**

VIII. SCALE-UP FACTORS FOR ZSK MACHINES
- **A. Machine Series Geometry Difference**
- **B. Basis for Scale-up Method Selection**
- **C. Volumetric Scale-up - Degree of Fill**
- **D. Alternate Method to Scale Throughput: Specific Mechanical Energy**
- **E. Scaling Shear Rate for ZSK Extruders**
- **F. Scale-up for Heat Transfer**

IX. LABORATORY, ASSEMBLY & OPERATION



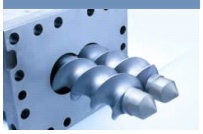




coperion
confidence through partnership

› compounding & extrusion
› materials handling
› service

ZSK 101



ZSK 101 COURSE OUTLINE

DAY 3:

X. TROUBLE SHOOTING THE PROCESS

XI. MAINTENANCE OVERVIEW

- **A. Maintenance Manuals**
- **B. Spare Parts**

XII. EXTRUDER WEAR/MATERIAL OF CONSTRUCTION

- **A. Types of Wear**
- **B. Wear Reduction/Process Related Minimization**
- **C. Wear Reduction/Special Materials of Construction**